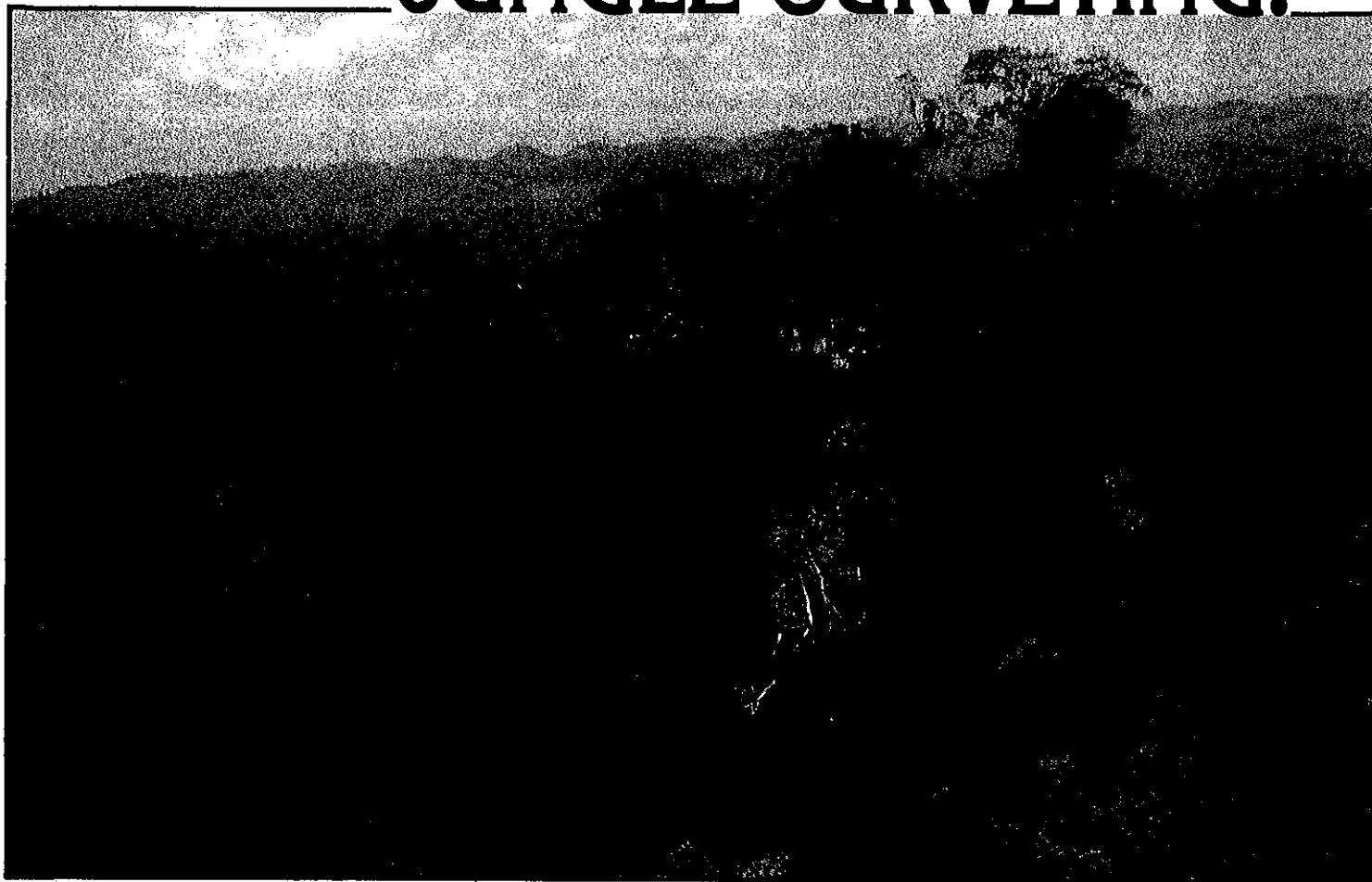


# JUNGLE SURVEYING:



*An aerial view of Caana, the largest architectural complex at Caracol, illustrates the massiveness of the complex and the dense jungle growth that must be cleared before mapping of the area can be undertaken. The towering complex is portrayed in the northeast corner of the mapped quadrangle of Caracol shown at right.*

**T**he archaeological ruins of Caracol, Belize are without doubt the most extensive ones within that Central American country. Most of the occupation and construction at Caracol dates to the Maya Classic Period or between A.D. 300 and A.D. 900. Not only is the tallest Pre-Columbian man-made construction in Belize located at the center of the site, but the ancient city extends outward with dense occupation for over three kilometers in all directions. At its height circa A.D. 600, the Caracol city-state dominated over 250 square kilometers and directly affected the policy of other Maya centers.

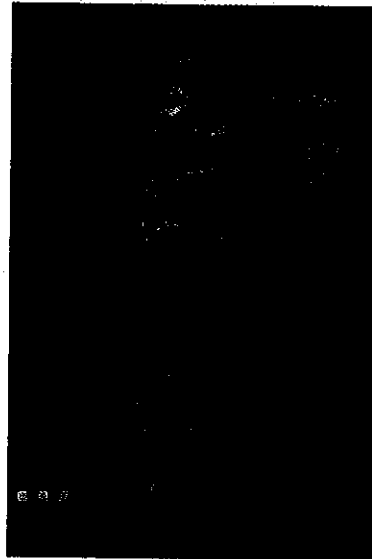
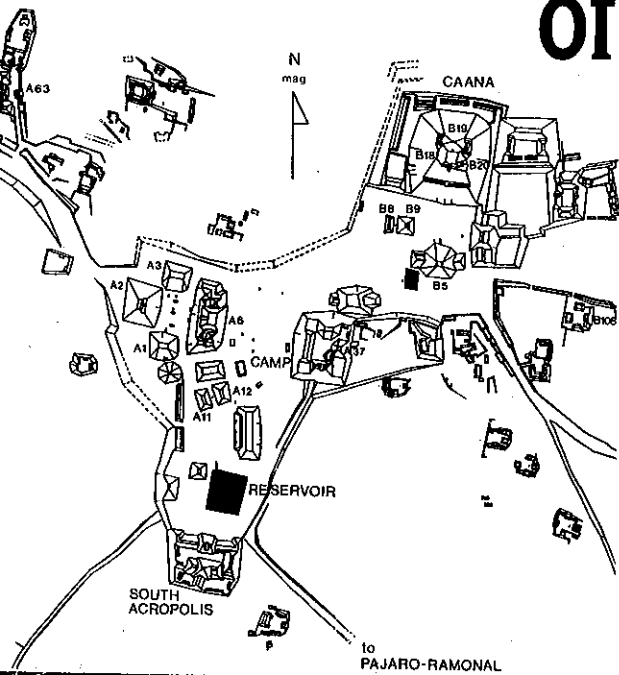
The Maya were one of the most advanced New World civilizations to have ever occupied the Western Hemisphere. Not only did they have a system of writing and mathematics that included the concept of zero, but they also transformed all of Guatemala and Belize, as well as parts of Mexico, El Salvador, and Honduras into a contiguous series of city-

states with architectural monuments and agricultural areas. The ruins of Caracol are located in a presently unoccupied section of the Maya area.

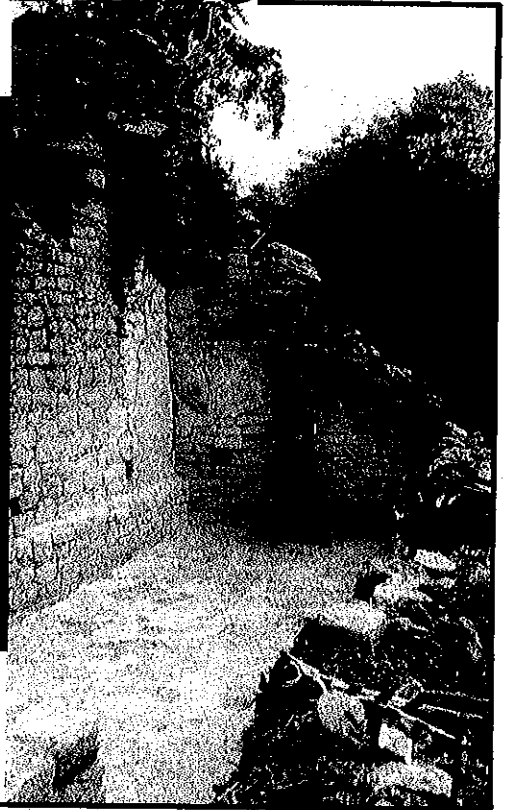
The full significance of Caracol in Maya prehistory is only now being unraveled through ongoing archaeological research at the site. One important aspect of this research is an active program of reconnaissance and mapping. The survey work thus far has provided new information about the physical layout of Caracol as well as data about the site's size and heavy settlement density. Another crucial part of the overall project focuses on the detailed excavation of the ancient remains. This aspect has produced new architectural information, unearthed new monuments and texts, and has also provided much new data regarding the spectacular tombs found at Caracol. A third part of the project focuses on the transcription of the written record left by the Maya of Caracol on their stone monuments. Within the past three

# Mapping the Archaeological Site of Caracol, Belize

by Dr. Arlen F. Chase



*A Maya Terminal Classic pottery incense burner uncovered in Caracol Structure A3. Many similar artifacts have been lost or destroyed as a result of looting at the Maya sites.*



*Excavation at Caracol Structure A3 revealed the fine architecture that is preserved beneath the collapsed earth.*

*Getting in and out of Caracol was just one of the many difficulties endured at the archaeological camp. Heavy rains often make the roads impassable.*

years, the conjoining of all three of these programs has generated a fresh understanding of the Caracol site and the critical role that it played in the Maya realm during the Classic Period.

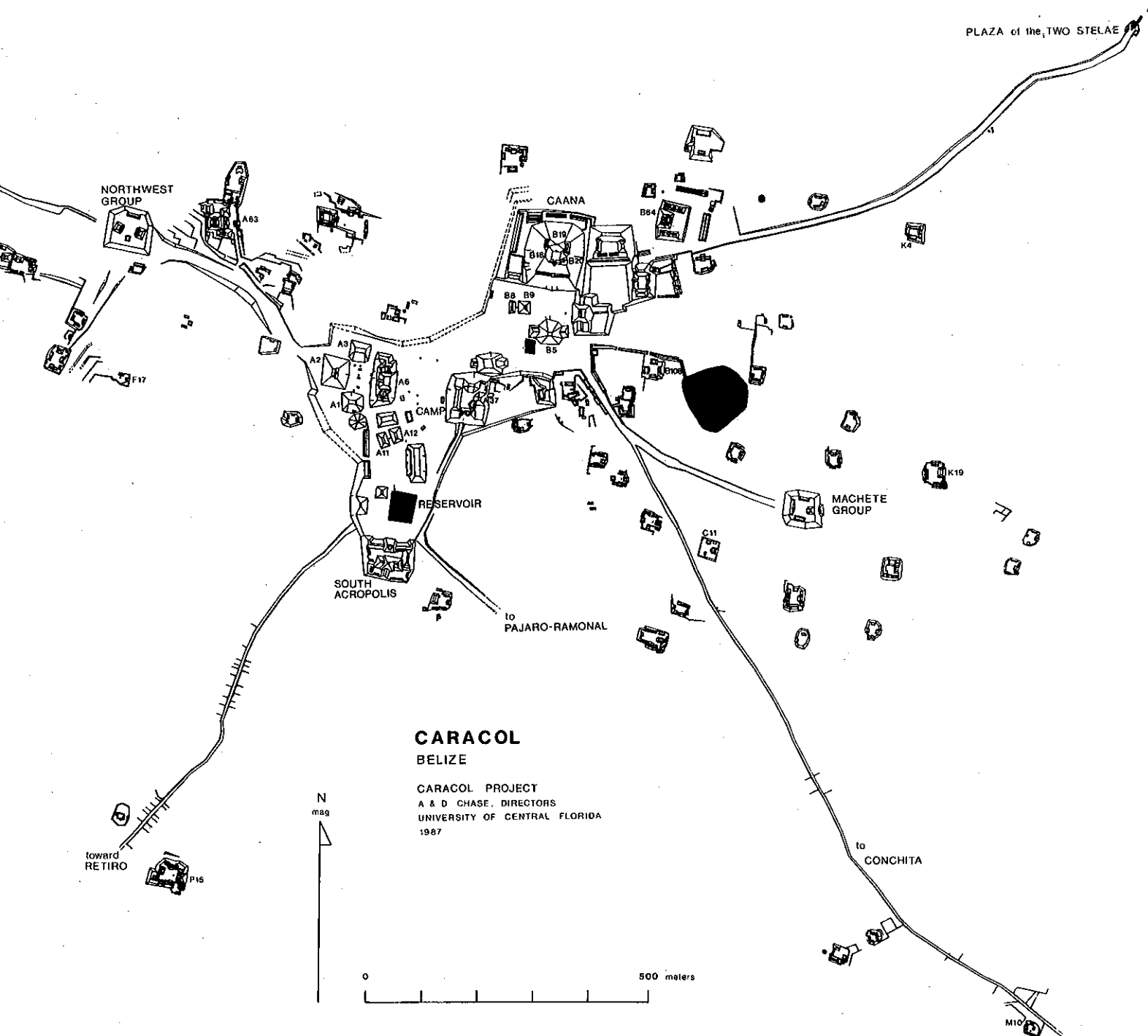
## The Caracol Project

Although Caracol literally means "snail" in Spanish, the site name derives from the curving and spiraling road that tenuously connects the ruins to civilization. Caracol was not always considered to be an important archaeological site. While known to archaeologists since 1938, the site was primarily recognized for its extensive series of carved and inscribed stone monuments. Between 1950 and 1953 the University of Pennsylvania mounted a series of expeditions that resulted in the removal of a selection of the carved stones

to Belize City, Denver, and Philadelphia. The monuments and their hieroglyphic inscriptions were eventually documented in *The Monuments and Inscriptions of Caracol, Belize* by Carl Beetz and Linton Satterthwaite (University Museum Monograph 45, University Museum, University of Pennsylvania, Philadelphia).

As a result of these initial investigations and the ones that followed by the Belizean archaeological commissioner, the more central groups of monuments were mapped and several impressive tombs were excavated and reported to the archaeological community.

Although a relatively long time had been spent on archaeological research at Caracol (approximately five field seasons), the map that was produced by the University of Pennsylvania project portrayed a relatively small site. There-



A map of the archaeological site of Caracol, Belize portrays Caana, the largest construction in the Belize country, in the northeast portion of the map. Radiating out from the central area are roadways or causeways that were used as the primary traverse routes for surveying Caracol. These causeways are an indication that the Maya had a conscious internal organization. Reservoirs (indicated by the shaded areas on the map) were built to provide water in areas lacking standing ponds or running streams.

## Jungle Surveying

*continued from page 11*

fore, most scholars considered Caracol to be an important, but not a major, Maya center.

While new mapping has indicated and continues to show that Caracol is much larger than initially portrayed, the discovery of a single stone monument in 1986 by the current project underscored, more than anything, the impact of Caracol on the Classic Maya realm. This monument, an altar located in the center of a Maya ballcourt, contained one of the longest Maya hieroglyphic texts found in Belize. Within this text was recorded war and the conquest of the major

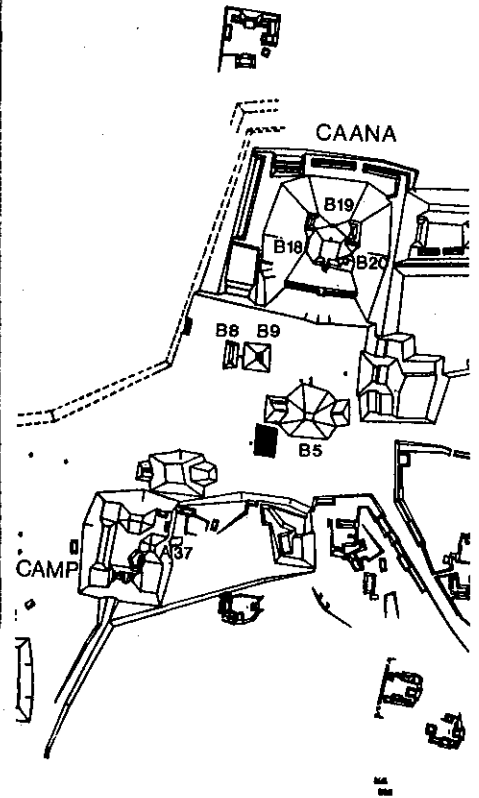
Guatemalan site of Tikal by Caracol in A.D. 562. This discovery helped to explain Tikal's known demise at that time, a problem that had long plagued researchers, and also correlated well with Caracol's rise to power. Other recovered archaeological information has clearly demonstrated the spectacular growth and success that Caracol achieved between A.D. 550 to A.D. 700, an era otherwise characterized by most scholars as one of general decline for the Maya area.

The latest Caracol Project, sponsored by the University of Central Florida (Orlando), was conceived in the summer of

*continued on page 14*



*The royal tomb of a woman, shown before excavation, from Caracol Structure B19. The tomb contained a single female interred with eight vessels. A mural text on the rear wall allowed the tomb to be dated to A.D. 634.*



## Jungle Surveying

*continued from page 12*

1983 when a brief reconnaissance was made to the site. Although minor work was undertaken in 1984, the first full archaeological season of the Caracol Project took place in 1985 from January through May. The majority of this first season was devoted to constructing a permanent base camp and providing a full understanding of the nature of the archaeological work that was to be undertaken in the next decade.

Exploratory excavation was undertaken to gain some idea of the settlement pattern and density at Caracol, as well as the logistical problems involved with working in such hilly topography. Work during the second season, January through June of 1986, saw continued excavation in the site's center, the discovery of several monuments, and the realization of the extensive Maya roadway system that existed within the Caracol core area. The importance of the archaeological remains uncovered during this season also placed Caracol in a new light, for it became clear that the site was a key innovative center that had directly affected the prehistory of the entire Maya area.

The third, 1987, season of the Caracol Project witnessed further excavation in the core area and, more importantly, the expansion of the Pennsylvania map from one containing 78 structures to a map containing almost 1100 buildings. Thus, Caracol's prominent role in the Maya area and its immense size during the Classic Period have been clearly established after three seasons of research by the University of Central Florida team. Future work will without doubt demonstrate that Caracol is one of the largest Classic Period Maya sites not only in Belize, but in all of Central America.

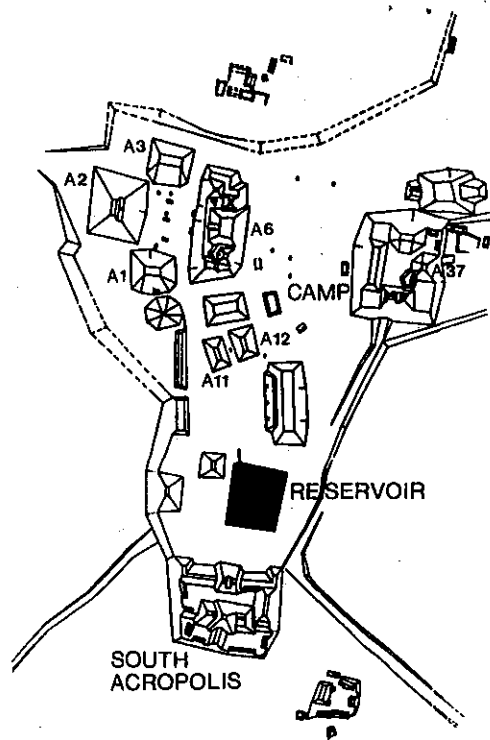
## Mapping the Ruins

The majority of Maya ruins are completely enshrouded in jungle growth. Caracol is no exception, for it is located deep within a heavily forested area in the foothills of the Maya Mountains of Belize at an elevation of over 500 meters above sea level. Access to the area is by means of a crude lumber road that is impassable when it rains. Caracol is located in a portion of Central America that receives heavy rainfall, making it difficult for workers and their supplies to get in and out of the site. Because of thick jungle overgrowth and the severity of the undulating terrain, the ruined buildings of Caracol do not stand out in aerial photography of the region. Therefore, all survey work requires time-consuming reconnaissance.

Traditionally, mapping Maya ruins has been undertaken in a number of ways and with varying degrees of accuracy. This variation in mapping procedures is directly related to the jungle terrain and to the different goals and research designs found in Maya archaeological projects. Detailed mapping usually involves the removal of the rain-forest jungle growth, a painstaking task. Because of monetary and schedule restrictions some accord must be reached between time and accuracy in mapping Maya ruins.

The quickest method of mapping in the Maya area is through the production of a sketch diagram in which the surveyor simply uses a compass and "paces" or otherwise estimates the distance between structures and the size of these structures. The representational accuracy is directly affected by these procedures because the jungle growth often precludes the discovery of even large structures only several meters from the surveyor.

*continued on page 16*



The most common way in which a Maya site is mapped is through the use of a plane-table system. IR Inc.'s PT1 was utilized for detailed mapping of large archaeological excavations. Shown here is Caracol Structure A2.

## Jungle Surveying

*continued from page 14*

An intermediate system of mapping incorporates the use of a compass and tape. The use of the compass and tape is also much more time-efficient than using the conventional transit (or theodolite) method as it does not require set-up time; it also generally requires less cutting of overgrowth.

The most common way in which a Maya site is mapped, however, is through the use of a transit (theodolite) or plane-table (with telescopic alidade) system. Such a system, though, is extremely cumbersome and time-consuming when it is utilized in the dense jungle or in the undulating terrain present at sites like Caracol. Because of the overgrowth, multiple set-ups are required daily to cover the terrain, and large areas of the jungle must be cleared to produce lines-of-sight. Again, all this activity takes more time, but is balanced by greater accuracy. From its inception, the attainment of such accuracy was deemed necessary by the Caracol Project in order to be able to use the mapped data to elicit general habitation patterns at the site. This decision was made in spite of the unstableness of the ground, hilly topography, and the dense jungle found at Caracol.

## Field Procedures

Mapping at Caracol proceeded with the creation of a concrete bench mark in the center of camp in early 1985 to which all measurements were related. Based upon the available government topographic maps, the elevation of this bench mark was arbitrarily selected as 500 meters above sea level and all further elevations were related to this initial one. At some time in the future it may be possible to uniformly correct the Caracol elevations by tying into a government bench mark located some ten kilometers south of the site. In an effort to get beyond the immediate site center, it was initially

decided to use the existing Pennsylvania map, that had been produced through the use of a transit and traverse system. All new measurements, however, were made independent of this map and were tied into the bench mark established in 1985; the new effort revealed some errors in the Pennsylvania map and the central groups are being resurveyed.

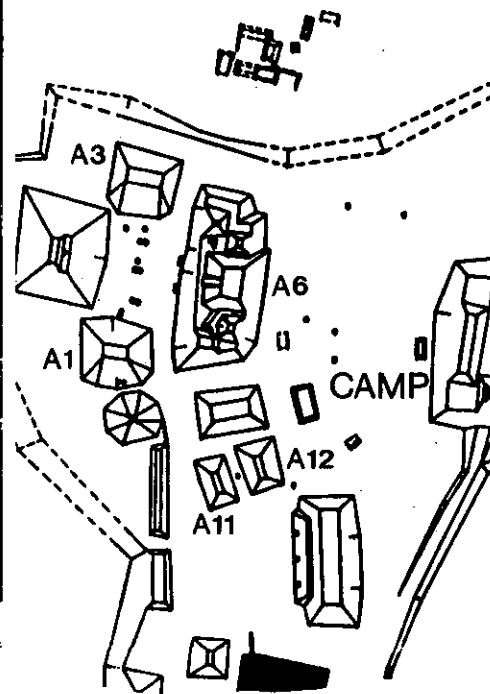
During reconnaissance in 1985 and 1986, a series of previously unknown long-distance causeways or Maya roadways were discovered radiating out of the Caracol center. Seven of these causeways have been discovered, five of which have been completely mapped. Because these Maya roads once integrated the ancient city, they became the primary traverse routes for surveying Caracol during 1986 and 1987, and are currently being used to facilitate modern-day movement throughout the massive site. It was unusual for such cultural features to be available for use as mapping traverses, ordinarily random traverses must be utilized at Maya sites. The Caracol causeways provide a view of how the Maya themselves physically organized their cities. The five causeways cleared of jungle covering thus far serve as the base traverses from which smaller traverses are cut for the purpose of facilitating mapping of other remains. Closure is attained by mapping between known points located on the various causeways. Carefully marked and surveyed hardwood stakes are positioned approximately every 100 meters along these roadways and are also placed within the courtyards of each mapped group; mapping between this series of stakes also permits the achievement of closure on a smaller scale.

A standard mapping team at Caracol consists of three or four individuals: the surveyor, his assistant, and one or two people to cut the survey lines. These lines are invariably

*continued on page 18*



A portion of Caracol Structure A3, rising some 16 meters above the plaza, looms in the background. A painted capstone found at the site contained a hieroglyphic text that has been dated to A.D. 695.



## Jungle Surveying

*continued from page 16*

taken off the primary causeway stakes. Two mapping variants are used at Caracol. First, the survey lines exist in their own right, running straight through the jungle for several 100 meters. In this system, plaza groups are mapped in relation to known points on the secondary traverse. (A plaza is an open space around which buildings are arranged.) A stake is established in the center of the plaza from which all corners are shot; it then becomes a permanent bench mark. Second, survey lines are also cut from a primary causeway stake to a group of buildings and then continued from plaza group to plaza group, eventually resulting in closure by tying the line back to a known causeway stake. Both of these systems of recording have been successfully employed at Caracol.

Once a stake has been established within a group of structures, the entire center of that group's plaza is cleared of all growth with the exception of massive trees. A sketch diagram is made of the buildings and various features by physically walking over each structure. A 30-meter tape is used to take measurements on each building and feature and the corners for each construction are marked for detailed survey. These corners are then mapped relative to the central stake using the EDM or conventional transit system; sometimes, more than one stake must be established within a single group or plaza area. This recorded information is then transferred to graph paper and the building and platform rectifications are produced. Rectifications are the mapped interpretations of the mounds of earth and cultural material. These amorphous lumps are then represented in rectangular form on the map. A platform implies an elevated plaza, from 20 centimeters to 3 or 4 meters in height. While the points can be plotted in the field and then ground-checked on the spot, in-field time can be more effectively utilized by plotting the points at night and then performing the ground check the next day.

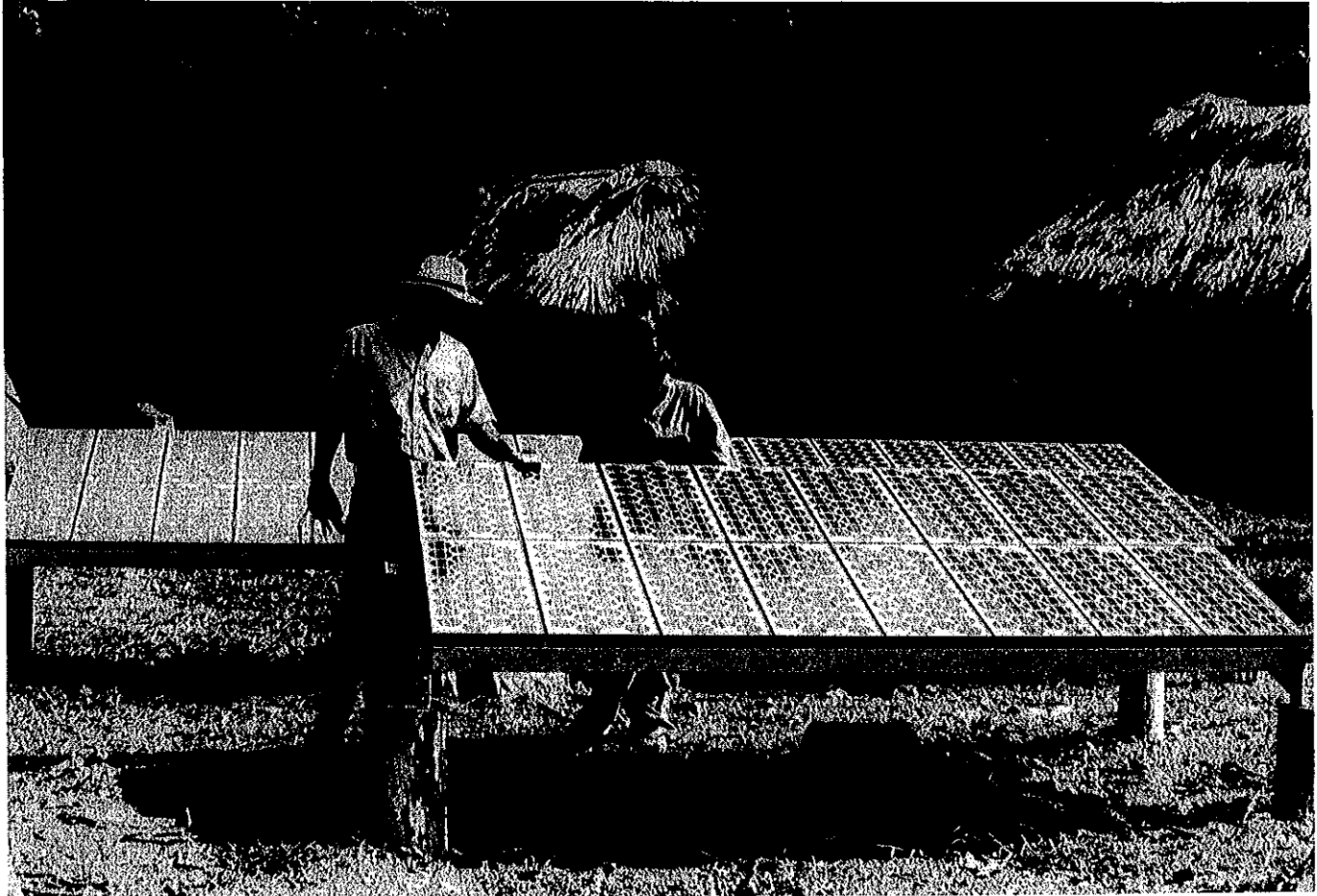
## Technology and Mapping

During the 1985 and 1986 mapping seasons, all survey work was undertaken by means of conventional transits and Philadelphia rods. This system was significantly upgraded during the 1987 season because of two donations to the project. The first donation was two EDM systems from IR Inc. (Orlando, Florida). One of these systems was a PT-1 plane table system, primarily useful for detailed mapping of large archaeological excavations. The second system was the IR Inc.'s Stinger that was attached to a conventional Geotec T24 theodolite. This second system proved indispensable for mapping the widely distributed settlement at the site, as well as the Maya roadways in evidence at Caracol. However, neither system could have been operational had it not been for a photovoltaic system installed at Caracol. This solar energy system was necessary because it allowed the EDM batteries to be easily recharged. As a result of these technological improvements, the Caracol map was increased from 496 mapped structures at the end of the 1986 season to 1066 at the end of the 1987 season.

The EDM systems and the photovoltaic system changed the way of life and mapping at the Caracol camp. With EDMs, obtaining distance measurements was quicker and more distant sightings could be made within a single, bush-cut line-of-sight. The EDMs also trigonometrically provided elevation measurements. However, the limits of the EDM systems were never approached because lines-of-sight were limited by the jungle topography and multiple set-ups were still necessary.

Just as the EDMs helped mapping proceed more rapidly and more accurately, the photovoltaic system was also instrumental in changing the way things were done at Caracol. The Florida Solar Energy Center installed three arrays con-

*continued on page 22*



**Field Director Diane Z. Chase and Florida Solar Energy technician Jim Dunlap check the solar panels of the photovoltaic system that was installed at Caracol in 1987. This photovoltaic system played a vital role at the site because it supplied the electricity necessary to charge the EDM batteries.**

## **Jungle Surveying**

*continued from page 18*

taining 48 panels in the center of the archaeological camp. This system supplied both AC and DC power through the use of an inverter and electricity and lighting were wired into 5 of the 12 buildings. Without this electricity, it would have proven impossible to give the necessary 12-hour charge to the constantly utilized EDM batteries.

The project generator could not be run for the extended periods of time necessary for such recharging. Even more important from a field standpoint, the photovoltaic system provided light that made detailed work, such as map plotting, possible at night — and all night, if desired. Kerosene lanterns, which had been previously used, did not provide adequate light for plotting; light produced by the generator was similarly limited by access to fuel and the ability to run the noisy generator for long periods of time when people were trying to sleep. Light produced by the solar energy system is not only available 24 hours a day, but is also silent. Thus, besides allowing batteries to be recharged, the photovoltaic system also increased the effectiveness of field time that could be devoted to mapping.

Traditional problems involved in mapping Maya sites still remain; the new technology simply makes it easier to deal with the problems.

Mapping at Caracol is difficult to undertake for a number of reasons. Primary among these is the fact that the ruins are completely covered by a dense jungle growth that must be moved in order to do any mapping. This removal still needs to be done by hand so that lines-of-sight between the

EDM and its attendant prism are created. Technology has still not produced an ecologically safe jungle “weed-eater” or a method to produce a detailed map without on-site work. The extremely steep hills and deep valleys found throughout Caracol make the site more difficult to survey than many Maya sites. While the Stinger is a far cry from many heavier EDMs, it and its associated transit and tripod are still not compact and light enough to easily carry about. After a dozen set-ups, all requiring moving the system some distance over the bumpy terrain, the surveyor sincerely wishes that bionic legs were more than a television fantasy.

## **Standards in Mapping Maya Ruins**

Other problems in mapping Maya ruins lay outside technology’s current range. Many of these problems are presented either by nature or by the researcher’s subjectivity. For instance, when man-made constructions are abandoned and face natural elements such as rain, wind, and plant roots, they soon fall apart and eventually become amorphous mounds of earth. While excavation within these mounds may produce remnants of the once beautiful buildings with their terraces and stairways that the Maya constructed, such features are not always readily evident from surface inspection. In fact, many features are almost totally obscured by natural and cultural transformation processes and may not be recognized by the inexperienced surveyor.

Much of the subjectivity found in making plans of Maya sites has been dealt with by past projects. For instance, by

*continued on page 24*

convention (and for good reasons), all records of measurements in the Maya area are metric. Site plans are usually recorded at scale of 1:500 for presentation at a scale of 1:1000 or at a scale of 1:1000 for presentation at a scale of 1:2000. Much of the decision regarding the overall scale that is utilized is based upon three variables: the surface architectural details that are visible at a site without excavation; what features are to be portrayed; and the overall size of the Maya site. However, the most common scale utilized by Maya archaeologists in preparing a site map is 1:1000; this is the scale at which the Caracol map has been prepared. Most maps are also usually aligned to magnetic north. A common referent scale of 1:1000 and magnetic north or true north is attempted by Maya researchers in order to facilitate intersite comparisons.

Almost all Maya site maps are also rectified. This rectification is undertaken in an effort to portray the height of the collapsed structures, now only indistinct, mounded areas. But, this rectification also allows some subjectivity to enter into the portrayal of Maya structures, depending upon the researcher's ability to recognize corners and, by means of these corners, structure orientation. Because rectification is also used in the Maya area either to directly or indirectly express building height, some differences also occur in portrayals of buildings, again dependent on the researcher. At some sites, the height of a building or platform is sometimes directly expressed as being the distance between the base and the summit of the parallel rectified lines. At other sites, such as Caracol, both the area of the summit and the area of the base are correctly presented. On still other maps, no such direct relationship is established.

Conventionalized symbols are also often utilized on Maya site plans. An open circle is frequently used to represent an underground "chultun," or Maya storage pit; an area delimited by "x"s usually represents a quarry. Lined areas with interior ticked lines are often utilized to indicate reservoirs and aguadas or depressions. Actual standing walls are portrayed either crosshatched or filled completely in. Symbols may also be used to portray other cultural features such as stone monuments and their position within the Maya site. Contour lines, if such appear, are often portrayed in a different color than that used for the rectified buildings; such contour lines may be found at intervals of from 1 to 5 meters and are primarily utilized to show the natural surface drainage system of the site. Thus, the finished map of any Maya site is a potpourri of information, from which various interpretations can be derived — providing that the symbols and rectifications are understood. It must be stressed again, however, that the more experienced the surveyor is in dealing with Maya ruins, the more accurate and precise will be the designation and presentation of cultural features.

### Results of the Caracol Mapping Program

The preparation of a detailed map of the archaeological ruins of Caracol serves several broader purposes. Besides simply representing the remains that are found at the massive site, the map and the work done to prepare it are important

to an understanding of general Maya settlement patterns. The study of the settlement patterns, or the way in which humankind distributes itself over its landscape, is a first step in the detailed examination of the culture that produced these spatial remains. Habitation patterns noted thus far at Caracol are already having an impact on our understanding of the Classic Maya Period.

Caracol's settlement differs from many other Maya sites in its vastness and in its internal organization. While most Maya sites are represented as being haphazardly spread over the environment, Caracol's causeways demonstrate that a much more conscious organization of this environment was envisioned by its Maya inhabitants both in terms of planned occupation as well as in its conscious harnessing of this environment through the construction of a multitude of reservoirs to provide water in areas lacking standing ponds or running streams.

This organization also integrated an extensive system of agricultural terraces with the site's center and the overall household occupation. These terraces represent perhaps the most extensive agricultural system yet found in a Maya city and are extremely difficult and time-consuming to fully map because of their expansiveness and large numbers. Distributed throughout these terraces are many groupings of Maya structures. The combination of the plaza groups, the causeways, terraces, and the larger plaza areas at the ends of causeways all combine to yield a picture of a massive garden-city that was carefully regulated by its ruling elite.

Preliminary calculations suggest that the density of settlement for the Caracol core is much higher than at other Classic Period Maya sites. For example, while almost 2300 structures were mapped in the central 16 square kilometers of Tikal, almost 1100 buildings have been recorded in the approximately 4 square kilometers mapped thus far at Caracol.

Simple mathematics would indicate that, should current trends continue, the Caracol settlement is almost twice as dense as that found at the important site of Tikal, often used as the standard of reference for the Classic Period Maya. Thus, it is clear that further research will not only change our view of the Maya at Caracol, but also directly alter the way in which we perceive the rest of the Maya area.

Three field seasons at Caracol have clearly demonstrated the importance of this site to Maya prehistory; future mapping, reconnaissance, and careful excavation can only serve to further augment our overall understanding of this remarkable civilization. ▲

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An opportunity exists for interested individuals to participate in and support the Caracol Project. For information regarding such activity contact Mr. Rusty Okoniewski, Assistant Director of Sponsored Research, University of Central Florida, Orlando, Florida 32816.

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*Dr. Arlen F. Chase is Assistant Professor of Anthropology at the University of Central Florida, Orlando. He and his wife, Dr. Diane Z. Chase, serve as Directors of the Caracol Project. They are currently involved in the fourth archaeological field season at Caracol. Dr. Arlen Chase is the author of numerous books and articles.*



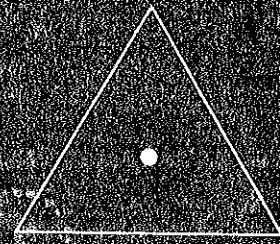
P.O.B. PUBLISHING COMPANY  
P.O. BOX 810  
WAYNE, MICHIGAN 48184

ADDRESS CORRECTION REQUESTED

FEBRUARY-MARCH 1988

VOLUME 13, NUMBER 3  
CIRCULATION 65,593

BULK RATE  
U.S. POSTAGE PAID  
P.O.B. Publishing Co.



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